The Influence of Fire Among the Habitats of Organisms Depending upon Water Content & pH Levels in Soil of Various Environments

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Figure 1: Undisturbed Fire Site.

Figure 2: Disturbed Fire Site.

Introduction

The New Jersey pine barrens is a fire-dependent forested region located within several counties. The pine barrens consist of a mosaic of upland, wetland, and aquatic habitats that are home to a large variety of wildlife. There are thin bands of finer textured soil that improves the water-soil availability, resulting in more plant growth. Wildfires allow the serotinous cones of the jack pine to open which aids in the dispersal of seeds. Fire also prepares the seedbed by exposing bare mineral soil, reducing competition from other plants, and increasing soil nutrient levels. **Luckily, we had a rare opportunity to observe this unique ecosystem the morning after a forest fire passed through the pine barrens.**

Hypothesis

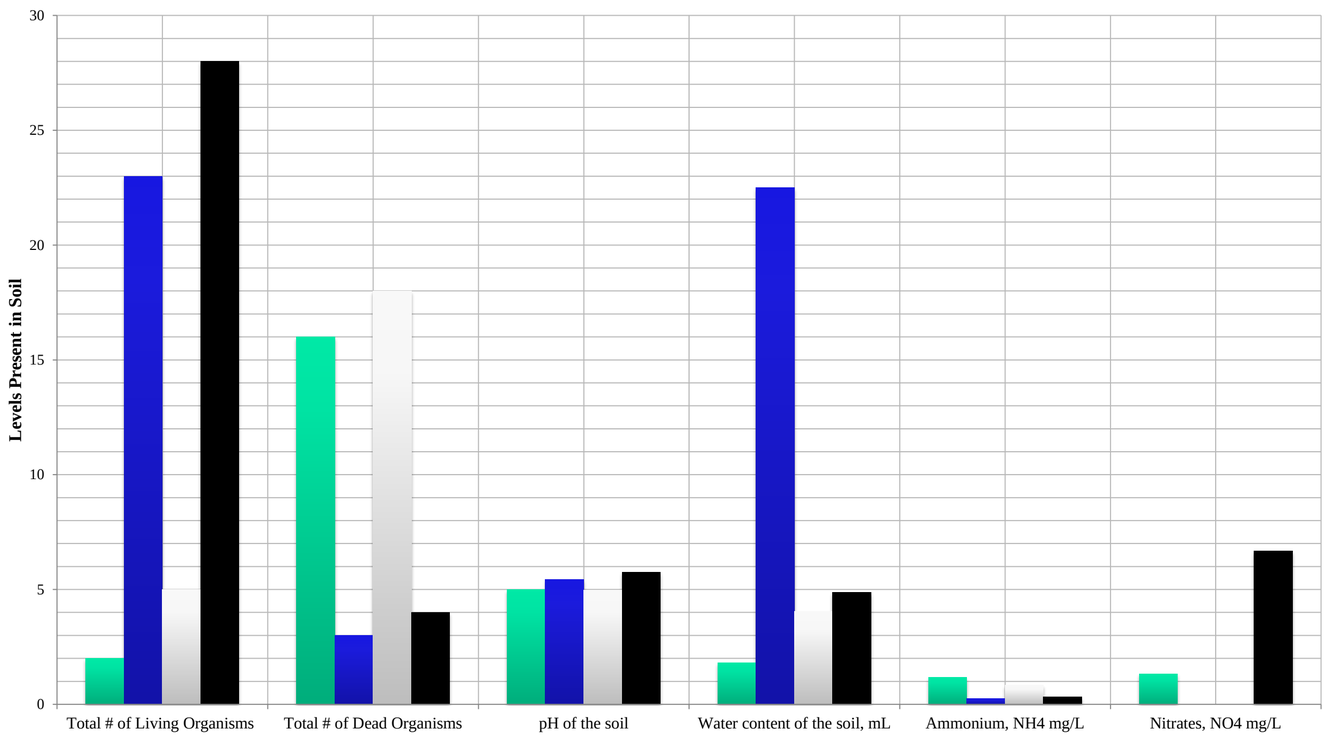
The heat and intensity of a fire vary and this will contribute to the effect the fire has on the community. The fire that was observed in the Pine Barrens was fast and of low intensity. An increase in forest fires will result in a decrease of living organisms and their ability to adapt to the environment.

Methods

- Soil samples collected form four sites:
  Bog site
  Meadow Site
  Undisturbed Forest Site
  Fire site
- Number of organisms alive and dead were recorded
- Water content of each site was determined by placing each sample in a drying oven and finding the difference between the final and initial weights.
- 5.0g of soil & 5.0mL of *H2O* from each site were incubated for 24 hours.
- The soil water mixtures were filtered and Hatch water test kits were used to determine the levels of pH, *NO4-, and NH4+*

Results

- The total number of living organisms was much greater in the sites that were not destroyed by fire; this includes the Bogg (23), and the Undisturbed Forest (28).
- The total number of dead organisms was greater in the sites destroyed by fire; this includes the Meadow (16), and the Disturbed Forest (18).
- The pH and water content of the soil was slightly greater than the sites not touched by fire.
- The sites not touched by fire have low Ammonium (NH4) levels.
- Fire had no effect on the Nitrate levels.



This graph demonstrates the number of organisms dead and alive, pH, water content, and the amount of Ammonia and Nitrates present in the soil samples extracted from two sites disturbed by fire (Meadow/ Disturbed Forest), and two sites not destroyed by fire (Bog/ Undisturbed Forest).

Common Name	Species Name	Meadow	Bog	Fire Disturbed	Fire Undisturbed
Reindeer Lichen	*Cladina rangifera*	A	R	A	A
Six-weeks Fescue grass	*Festuca octoflora*	A	R	A	C
Common Greenbrier	*Smilax rotundifolia*	A	A	A	A
Haircap moss	*Polytrichum juniperinum*	A	C	A	A
Fringed-bog moss	*Sphagnum fimbriatum*	R	A	R	R
Pitcher plant	*Sarracenia purpurea*	N	A	N	N
Golden Club	*Orontium aquaticum*	N	A	N	N
Field Ant	*Formica subsericea*	A	C	A	A
Carpenter Ant	*Camponotus pensylvanicus*	A	C	A	A
Mealworm Beetle	*Tenebrio molitor*	R	R	C	A
Hacklemesh Weaver	*Amaurobius ferox*	A	R	C	C
Yellow-Jacket Bee	*Vespula maculifrons*	C	R	R	A
Bumble Bee	*Bombus Fervidus*	C	R	R	C

This table displays the species of the organisms and plants found at each site. (A) Abundance (R) Rare (C) Common (N) None

Figure 3: Quadrant at Disturbed Fire Site.

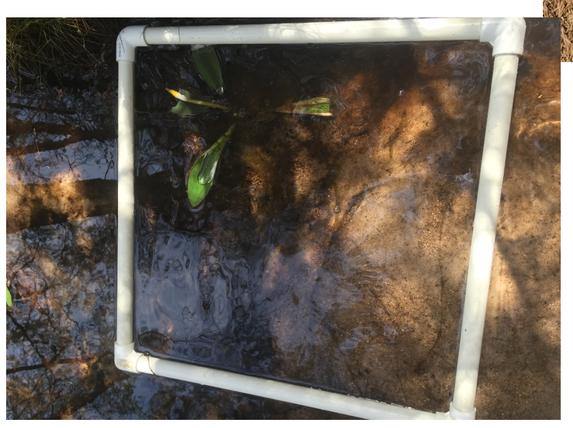


Figure 4: Quadrant at Undisturbed Fire Site.

Conclusion

In the sites that contained low levels of Ammonium, there was an increase in the number of living organisms found. There was no correlation between the Nitrate levels and the number of organisms at each site. The pH was slightly lower at the sites that had an increase in the number of living organisms and the water content was greater. The number of living organisms was much greater in the sites that were not destroyed by fire; which included the Bogg and the Undisturbed Forest site. The number of dead organisms was much greater at the sites that were destroyed by fire; which included the Meadow, and the Disturbed Forest site. The living organisms that were located in the sites that were destroyed by fire were adaptable to such conditions. Some species included: *Formica subsericea* (Field Ant), *Camponotus pensylvanicus* (Carpenter Ant), *Cladina rangifera* (Reindeer Lichen Plant),